

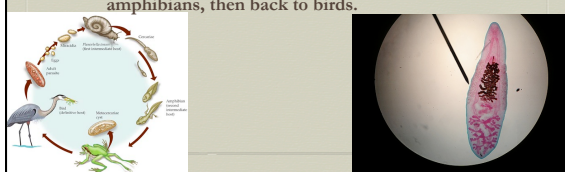
Trematodes

Jackson Minnich

- ## Agenda
- What are trematodes?
 - Trematode life cycle
 - How are amphibians infected?
 - What are the effects of infection?
 - Factors contributing to infection
 - Real world declines in amphibian populations

What is a trematode?

- Parasitic organisms that move from host to host in a defined cycle.
- In the case of *Ribeiroia* spp. the cycle starts with wading birds, moves to snails, then moves to amphibians, then back to birds.



The diagram illustrates the life cycle of Ribeiroia spp. It shows a wading bird (likely a grebe) defecating in water, which contains eggs. These eggs hatch into miracidia, which infect snails. Inside the snail, the parasite develops through various stages (sporocyst, cercaria) and is eventually released as cercariae. These cercariae infect amphibians (like frogs and tadpoles), where they develop into adults. The adult trematodes then migrate to the bird's feet, where they can be transferred back to a new bird host during the next defecation event.

The micrograph shows a single, elongated, pinkish trematode with a dark, internal structure, likely the suckers or suckers, which are characteristic of these parasites.

How are amphibians infected?

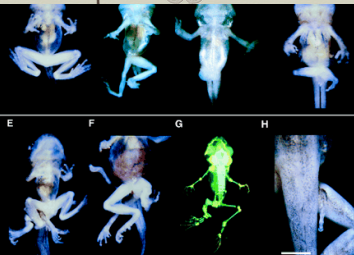
<https://www.youtube.com/watch?v=u3zbwWfoYmg>

How do trematodes affect amphibians?

- ☞ Limb extensions
- ☞ Extra limbs
- ☞ Partially missing limbs
- ☞ Skin fusions

Johnson et. al. 1999

How do Trematodes affect amphibians cont.?



Johnson et. al. 1999

What other factors affect trematode infections?

- ☞ Herbicides such as atrazine.
 - ☞ This chemical increases the abundance of freshwater snails
 - ☞ The increase in freshwater snails increases the abundance of larval trematodes.
 - ☞ The chemical also increases the susceptibility of amphibians to larval trematodes.

Rohr et. al. 2008

Declines

- ☞ Study was done on Northern Leopard Frogs
- ☞ This study focused mainly on mortality due to infection before the tadpole metamorphosed.
- ☞ Infections before limb buds caused a 47.5%-97.5% mortality.
- ☞ Infections after limb buds were developed resulted in a high malformation percentage.

Schotthoefer et. al. 2003

Declines cont.

Time (days)	Survivorship (Squares)	Survivorship (Circles)	Survivorship (Triangles)
0	1.0	1.0	1.0
1	1.0	0.8	0.3
2	1.0	0.75	0.2
3	1.0	0.7	0.15
4	1.0	0.65	0.1
5	0.95	0.6	0.05
6	0.9	0.5	0.05
7	0.85	0.45	0.05
8	0.8	0.4	0.05
9	0.75	0.38	0.05
10	0.75	0.35	0.05
11	0.75	0.35	0.05
12	0.75	0.35	0.05
13	0.75	0.35	0.05
14	0.75	0.35	0.05

Schotthoefer et. al. 2003

So why is all this important?

- ☞ Trematodes are an active parasite that influences the behavior of amphibians.
- ☞ They alter the limb development of adult amphibians, and have a high mortality rate in tadpoles before the emergence of their limb buds.
- ☞ The trematode actually wants the amphibian to be eaten by a wading bird so that it can complete it's lifecycle.

Summary

- ☞ What a trematode is.
- ☞ Trematode life cycle phases
- ☞ Infection vectors
- ☞ How are amphibians affected
- ☞ What other factors contribute to trematode infection
- ☞ Real world example of declines and mortality

Questions?



Literature Cited

- ☛ Pieter T. J. Johnson, Kevin B. Lunde, Euan G. Ritchie, and Alan E. Launer 1999. The Effect of Trematode Infection on Amphibian Limb Development and Survivorship. *Science* 30 April: 284 (5415), 802-804.
- ☛ Rohr, Jason R., et al. 2008. Agrochemicals increase trematode infections in a declining amphibian species. *Nature* 455.7217: 1235-1239.
- ☛ Schotthoefer, Anna M., et al. 2003. Influence of *Ribeiroia ondatrae* (Trematoda: Digenea) infection on limb development and survival of northern leopard frogs (*Rana pipiens*): effects of host stage and parasite-exposure level. *Canadian Journal of Zoology* 81.7: 1144-1153.
